

# Flight Testing of Resource allocation for Multi-Agent Planning (ReMAP) System for Unmanned Vehicles, Phase II Project

SBIR/STTR Programs | Space Technology Mission Directorate (STMD)



## ABSTRACT

Area-I, Incorporated personnel have led the design, fabrication, and flight testing of fourteen unmanned aircraft, one manned aircraft, and numerous advanced guidance, control, and avionics packages. Area-I has continued this tradition in its development of the Resource allocation for Multi-Agent Planning, or ReMAP, guidance and navigation system for unmanned aircraft. The ReMAP system, whose core function is to significantly reduce operator workload by providing mission-driven autonomy to unmanned aircraft in single- and multi-agent scenarios, was proven through flight testing during the Phase I program. The work proposed will further mature the ReMAP technology and core capabilities, resulting in continued flight-based evaluations on Area-I aircraft. Core capabilities provided by the ReMAP system include: 1) A small, lightweight, inexpensive avionics package that provides real-time mission-driven guidance capabilities to unmanned air vehicles 2) A system architecture that is platform and autopilot agnostic and can therefore be utilized by a wide array of aircraft with varying performance levels 3) A multi-agent planning and control algorithm to allow multiple aircraft to coordinate and thereby maximize mission capabilities and results 4) Aircraft and obstacle avoidance capabilities, including ADS-B In integration, providing autonomous avoidance maneuvers or operator warnings 5) A mission planning interface to provide situational awareness and mission management to operators, usable as a stand-alone system or integrated with existing mission planning tools such as NASA's Airborne Science Mission Tools Suite

## ANTICIPATED BENEFITS

### To NASA funded missions:

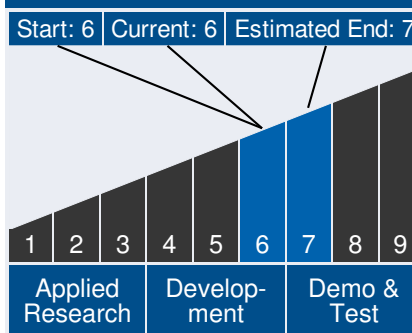
Potential NASA Commercial Applications: The ReMAP system provides a unique ability to enhance two of NASA's mission directorates: the Aeronautics Research Mission Directorate



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## Technology Maturity



## Management Team

### Program Executives:

- Joseph Grant
- Laguduva Kubendran

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(ARMD) and the Science Mission Directorate (SMD). The system improves the goals of the ARMD through the development of a system that promotes the safe integration of unmanned aircraft systems into the National Airspace System (NAS) and is in line with the goals of the NextGen system. The majority of others' work performed in multi-agent systems has been largely academic and often solves very specific or theoretical problems. The goal of the ReMAP development, however, has been to provide a successful and operationally relevant product that may be used in a wide variety of applications. The result is a system that has a significant potential impact on the SMD to support a variety of missions, both present and future.

## **To the commercial space industry:**

**Potential Non-NASA Commercial Applications:** The ReMAP system has a large number of end-use applications, including multiple aircraft platforms and mission types. Analysis shows that a multi-UAS system such as ReMAP is key to enabling UAS for commercial applications. Our strong industry support shows the significant impact the ReMAP system may have on UAS applications and provides a clear path to commercialization. The system may be commercialized as a stand-alone system, or coupled as an add-on to COTS autopilot systems. Area-I may also commercialize turn-key, ReMAP enabled aircraft as well as multi-agent mission support.

## **Management Team (cont.)**

### **Program Manager:**

- Carlos Torrez

### **Principal Investigator:**

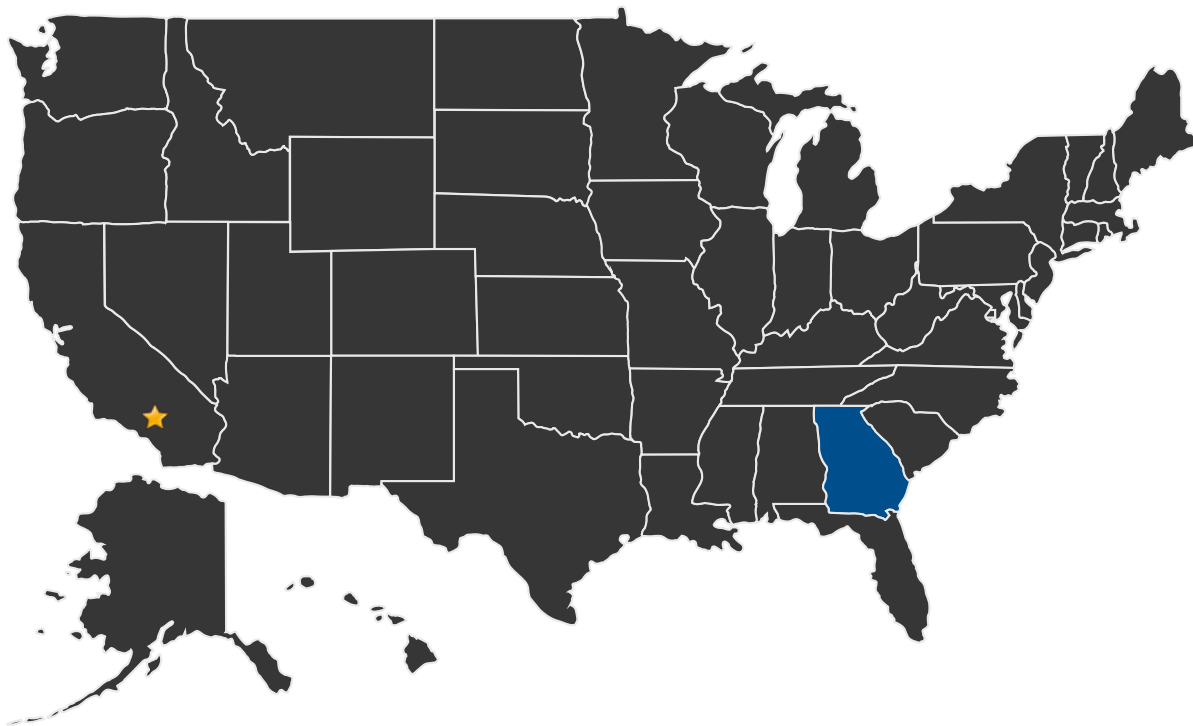
- Daniel Kuehme

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## U.S. WORK LOCATIONS AND KEY PARTNERS



■ U.S. States With Work



**Lead Center:**

Armstrong Flight Research Center

### Other Organizations Performing Work:

- Area-I, Inc. (Kennesaw, GA)

## PROJECT LIBRARY

### Presentations

- Briefing Chart
  - (<http://techport.nasa.gov:80/file/23543>)

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## IMAGE GALLERY

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*Flight Testing of Resource allocation  
for Multi-Agent Planning (ReMAP)  
System for Unmanned Vehicles, Phase  
II*

## DETAILS FOR TECHNOLOGY 1

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### Technology Title

Flight Testing of Resource allocation for Multi-Agent Planning (ReMAP) System for Unmanned Vehicles, Phase II

### Potential Applications

The ReMAP system provides a unique ability to enhance two of NASA's mission directorates: the Aeronautics Research Mission Directorate (ARMD) and the Science Mission Directorate (SMD). The system improves the goals of the ARMD through the development of a system that promotes the safe integration of unmanned aircraft systems into the National Airspace System (NAS) and is in line with the goals of the NextGen system. The majority of others' work performed in multi-agent systems has been largely academic and often solves very specific or theoretical problems. The goal of the ReMAP development, however, has been to provide a successful and operationally relevant product that may be used in a wide variety of applications. The result is a system that has a significant potential impact on the SMD to support a variety of missions, both present and future.